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Furniture Systems

CHAPTER CONTENTS

INTRODUCTION

Furniture systems are a wide range of furniture types comprised of components which combine to create a custom designed work environment to meet specific functional needs. This chapter is intended to give users a working knowledge of the basic types of furniture systems available today. It also touches on other types of furniture systems which have more limited application.

The primary audience for this chapter includes base civil engineers, MAJCOM and base interior designers, base contracting, facility managers and design contractors.

The secondary audience includes command level personnel and representatives of user groups who may benefit from a general understanding of the types of available furniture systems and their advantages and disadvantages.

No manufacturer or product line is mentioned by name except in the matrix section which lists the manufacturers holding current GSA contracts (Federal Supply Schedule, FSC Group 71, Part II, Section E). The three most-used systems are represented in the product lines of most of the major manufacturers; however, UNICOR, at present, markets *only a panel supported system.* Chapter users should consult manufacturers' catalogs for specific information on product lines. Though the basic concept of each furniture system type is similar, there is significant variation in detail among manufacturers.

We recognize that manufacturers are constantly developing and introducing new products which will eventually be incorporated into the Federal Government's contracts; therefore, this section will need to be updated from time-to-time. All commercial furniture manufacturers should be able to adhere to the stringent testing performed by BIFMA (Business and Institutional Furniture Manufacturers Association).

BACKGROUND

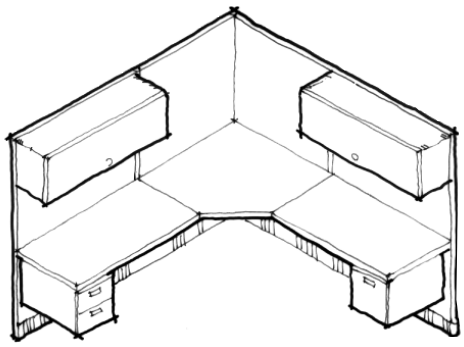
Systems furniture is ergonomically designed to meet all types of conditions and requirements. Work stations fully defined by panels are no longer perceived to be flexible enough to accommodate the ways more and more people are working and how they will work in the future. The manufacturers are responding and furniture systems continue to evolve. Current technology and modularity remains a driving force behind the design and development of workstations. Some manufacturers have specifications available in both metric and the U.S. standard measurement systems.

SYSTEM TYPES

The basic advantages of furniture systems are two. The standard unit of measure for the cost of office space is the square foot of floor area. First, furniture systems save floor area by taking advantage of the vertical dimension – using space above work surfaces for storage or filing and by stacking storage and filing components. They are also carefully designed to make every square inch of horizontal area count. The second advantage is that they can be rearranged to accommodate changing needs.

There are three basic types of furniture systems: panel-supported, stackable panel and desk-supported. There are combinations and permutations of these and also of some other basic types which are less used. Most panel systems can only accommodate their own components. You can not mount Brand X components on Brand Y panels; however, we understand even this will be changing in the future. A premium is paid for systems furniture, which is the price paid for flexibility to rearrange furniture as missions and work place locations change. This premium is wasted when more than one system's manufacturer is used in a facility, because it defeats the flexibility for future changes. It is strongly recommended a single manufacturer be used throughout a facility or organization. Another recommendation is to select a system which can be easily converted from panels to floor supported and back again. This furniture type will meet almost any requirement which could arise.

Panel-Supported System



This is the original type and is referred to herein as the traditional panel system. Panels are available in a variety of modular heights and widths. They typically have a steel perimeter frame; the core can be of a variety of materials and the panels can be surfaced with any number of materials. Virtually all panel systems have some provision for power and data distribution, though the sophistication of these varies greatly. All product lines incorporate storage units, filing units and work surfaces – mountable at varying heights on the panels – as well as a variety of accessories.

This is the system we see most frequently in Air Force installations. It is the basic system offered by UNICOR at this time and a large number of product lines are on the GSA Schedule. Construction, quality of detailing, extent and flexibility of power provisions and materials are reflected in the relative cost of product lines. This system still dominates the industry, though this is changing. The panels can be used as space dividers in non-traditional office areas. These systems can be reconfigured but panel heights, once chosen, cannot be altered; conversion to the somewhat more open work stations, popular now, may require the purchase of additional panels of varying heights.

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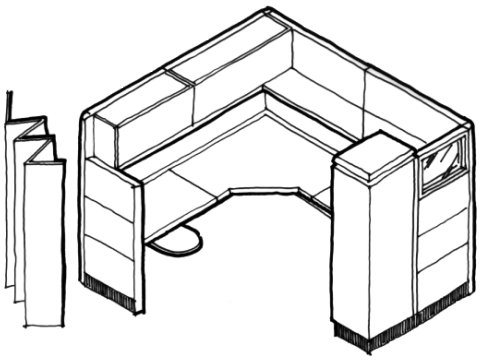
Stackable Panel System



When you buy a traditional panel you have a panel with a height which can't be changed. By the late 1980s this came to be viewed as unduly limiting. The result is the stackable panel system.

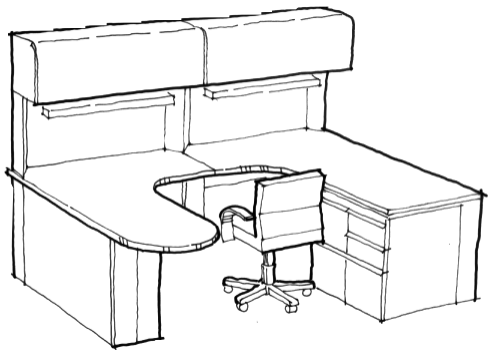
This system also consists of panels of varying width and height. Once selected, the width is fixed. The height, however, can be increased by stacking one or more additional panels, of the height desired, on top of the base panel. Completed panel height can be anything from the work surface to the ceiling and heights can be changed on-site by adding or deleting panels. Construction details vary, but each stackable unit typically consists of a steel frame designed for easy fastening to the panels above and below. Panel surfaces are referred to as "tiles" and can be left open, glazed or covered with a variety of materials.

Like traditional panel systems, stackable systems incorporate a number of options for power and data distribution and also accommodate work surfaces, storage and filing components mountable at varying heights. Since stackable panels are a second generation product, the variety and flexibility of components and power capabilities tend to be greater than in the traditional panel systems.

Words of caution: Some manufacturers appear to have stacking panels because the "tiles" can be interchanged. However, the basic frame, which the tiles are attached, is not adjustable in height. A scored pattern of "tiles" on a panel installation does not always mean that it is a stackable system. Some vendors of traditional panels use the scored/grid pattern only as a design motif.

Stackable panel systems cost somewhat more than traditional panel systems. Most major lines are on the GSA schedule and more are being added. Stackable panel installations are more easily adapted to some of the newer work station concepts than traditional panel systems. Like traditional panels, stackable panels can be used as space dividers in non-traditional office installations and can be equipped with writing or layout areas.

Desk-Based Systems



By the early 1990s, major panel users were becoming dissatisfied. The flexibility inherent in the panel systems they purchased was not being used – either it was not really needed or it was too cumbersome to accomplish. The increasing sophistication of the panel construction had also made them increasingly expensive. Too much enclosure inhibited the evolving collaborative work styles. The users began to question how many panels were really needed or, in some situations, if they were needed at all.

The industry responded with desk-based systems. The work surfaces are floor supported. Vertical structural elements (columns and stanchions) are available that can support shelves, overhead cabinets, and filing components. Privacy is maintained by the use of partitions that can be mounted to the work surface generally no more than 24 inches in height.

Hard-wired power provisions are incorporated into better desk-based systems. These can be extensive and flexible and used in conjunction with electrified panel systems. Data cabling can easily be run in most systems and cable management is comprehensive.

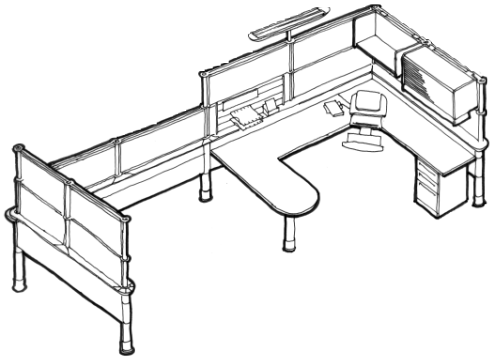
Desk-based systems cost less than either traditional or stackable panel systems if used alone. However, these systems are frequently used in combination with one of the panel systems and this can substantially affect the total cost per station. Desk-based systems are well represented on the GSA schedule.

Clusters

These consist of three or four work stations arranged pinwheel fashion around a core or common point. The core element can be used as the power distribution source and can also accommodate air distribution. Few panels are required to form a cluster and the work stations are typically small and basic. Clusters generally take more floor space because they require circulation space on all sides. Clusters are also not easily reconfigured without significantly altering and/or replacing their major parts. The GSA schedule defines clusters and lists vendors; the systems are very economical.

Cluster arrangements can be achieved with either panel system or desk-based systems; however, the use of overhead cabinets or shelves would have to be considered and minimized in a five-pod configuration for example. The advantages are the same as for manufactured clusters and the clustered work stations can be customized and equipped to better meet user needs.

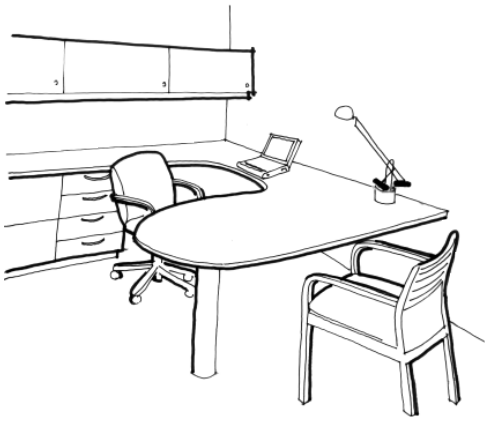
Beam-Supported Systems



In these systems, a structural beam, usually incorporating a power raceway, spans between vertical posts. Work surfaces and pedestals are cantilevered off the beam, with the advantage that the work surfaces can be of any length desired – they do not have to span between panel joints, where the mounting brackets are located in panel systems. Overhead storage units and privacy panels are mounted to posts which are extensions of the posts supporting the beam.

Beam-supported systems do not lend themselves to frequent reconfiguration; the beam and its supporting posts are the limiting elements. These systems compare in cost to a desk-based system used in combination with one of the panel systems.

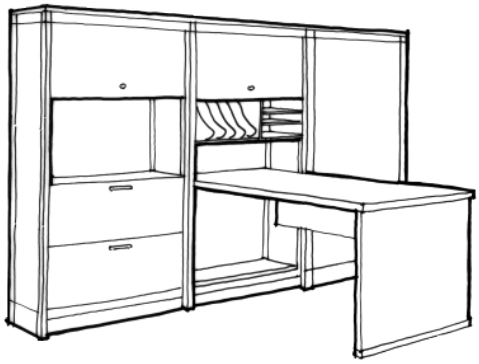
Wall-Based Systems



All panel systems have bracket-mounted work surface and storage components. These can be mounted to building partitions as well. This usually requires a vertical track, which is secured to the partition, and this track is clearly visible. A few manufacturers have track systems which are specifically designed for mounting to partitions; horizontal tracks concealed by the component being supported are used, so no mounting hardware is visible.

Good applications for these are where existing partitioning is retained but where the flexibility and appearance of furniture systems components are desirable. Advantage is also in small office areas. Components can be moved horizontally.

Cabinet-Based Systems



Typically used in conjunction with other systems types. These generally consist of relatively tall cabinet units which can be outfitted with shelves or file drawers. Work surfaces can be connected to the cabinets at right angles and traditional panels can often be integrated into groupings of cabinet units. Power and communication/data raceways at the cabinet base and top, with extensions to the beltline, are common. Cabinets can store a great quantity in a small floor space. A variety of finishes are available.

Demountable Walls

Either traditional or stackable panel systems can be used to build full-height partitions, incorporating standard doors where necessary. Either system can be used as an acoustical barrier when sound privacy is an issue. Panels used in this manner and demountable wall systems are not cost effective for the construction of private offices; drywall construction is more economical initially. Demountable walls if reconfigured or moved a few times would be more cost effective and less disruptive. However, be aware that demountable walls are purchased with O&M funding and are not counted against the construction budget. Also they are environmentally friendly by saving landfill space that would be used when changing drywall offices. Some demountable walls have a “universal” track, which allows for Brand X components to be mounted to Brand Y wall track. Existing sprinkler systems and air circulation are important considerations if demountable walls are entertained. If demountable walls are specified and installed correctly, the ceiling tiles shouldn’t have to be cut.

RECOGNIZED SOUND TRANSMISSION CLASS OF COMMON PARTITIONING MATERIALS

Average Hollow Metal Door	18
Solid Core Wood Door, Not Gasketed	22
1/4″ Safety Laminated Glass	34
2-1/2″ Gypsum Board, 4″ Wood Studs	38-40
2-5/8″ Gypsum Board, Metal Studs	42
Movable Metal Partition	38-42
Double Laminate Gypsum & Steel Stud	50
Concrete 4″	46
Concrete 6″	49
Concrete 8″	51
Concrete 12″	53
Concrete 16″	58
Concrete Block 4″, Painted Both Sides	41
Concrete Block 6″, Painted Both Sides	43
Concrete Block 8″, Painted Both Sides	45
Concrete Block 12″, Painted Both Sides	48
1/4″ Steel Plate	38
Dual Glazed Windows, 1/4″ Thick Lights	38-42
Staggered Steel Drywall Partition	45

Hybrids

One of the strengths of the furniture systems industry is the imagination which has been used in assuring that different product lines can be used together. Desk-based or free-standing components can be combined with panel systems in almost limitless combinations. So far, these combinations are generally limited to the products of a single manufacturer, though there are initiatives underway to make at least some products adaptable to those of other manufacturers. The future will bring more of these.

PARTS AND PIECES

Furniture systems are composed of many elements and each product line is unique in some way. However, there is some commonality among parts; the descriptions which follow illustrate some of the common components of which traditional panel, stackable panel and desk-based furniture systems are composed.

Traditional Panel

Panel construction differs, but there is typically a perimeter steel frame on a separate base section. The core can be a combination of gypsum, sheet metal, acoustical or non-acoustical, tackable or non-tackable, and other material. Surface materials can be glazed, fabric, laminate, wood or metal.

Stackable Panel Frame and Tiles

Stackable panels typically have a perimeter steel frame, usually resting on a separate base. Core materials vary and some system panels have no core. The “tiles” clip into the frame. Tiles can be covered in a variety of materials or can be glazed. Eliminating tiles, but retaining the frame, saves money and provides a sense of definition with openness; below the work surface, tile deletion or the

use of perforated tiles improves air circulation and helps dissipate heat from electronic equipment.

Non-Modular Panel Connection

Some panel systems can accommodate T or X connections at points other than panel ends. This allows greater flexibility in rearranging panels.

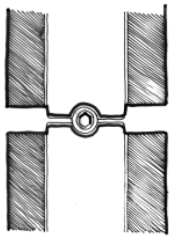
Desk-Supported Work Surface

The supports take the form of structural legs, often called stanchions, at the back corners. The work surface is bracket-mounted off the stanchions. The stanchions can be extended vertically to accommodate overhead storage elements.

Base Levelers

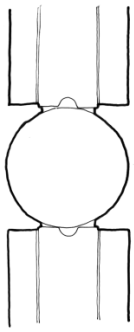
There is almost always some sort of leveling device which adjusts to compensate for unlevel floor conditions. Typically, the base section, powered or unpowered, supports the levelers. To improve airflow in work stations where CPU's are placed under the work surface, levelers may be used to elevate panels by an inch or more to create some air movement.

Panel-to-Panel Connection



Each manufacturer uses somewhat different panel connectors. Here, a section at the top "grabs" the panel on each side and is tightened by turning a threaded rod. Narrow, well-detailed and consistent vertical panel joints are typical of better-designed systems.

Panel-to-Post Connection



Here, the panel connector device takes the form of a vertical column, incorporating slots for mounting work surfaces and storage units. This system alleviates panel creep.

Typical Panel End

Sometimes the slots for component mounting are incorporated into the end of the panel, rather than in the panel connector device.

End Trim Piece

Configurations vary, but panels always have a snap-on trim piece at exposed panel ends. Some manufacturers treat this piece as a design device to give their product a distinctive appearance.

Panel Cap with Cable Tray

Most systems have an available tray at the top of the panels which can accommodate communication and data cable. With or without the cable tray there is a top trim piece which can take a number of configurations. Panel-top cable trays do not work with panels of varying heights.

Corner Piece with Cable Shown

Fiber optic cable requires gentle bends (usually a minimum 4 inch radius) at corners. Corner sections of most systems will accommodate this.

Pedestal-Floor, Suspended, Wheeled, Bracket

Pedestals – usually called "peds" – incorporate storage or files. They can be floor-supported, in which case they can also be used to support work surfaces; bracket-mounted from panels or desk-based system stanchions; suspended from the work surface; or mounted on casters for versatility.

Overhead Storage Unit — Ways to Mount

Overhead storage or filing components are bracket-mounted and can be mounted to panels, to vertical stanchions for desk-based systems or to tracks mounted to building partitions (wall mounted).

Overhead Storage Unit Doors

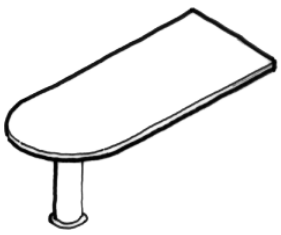
Doors can lift and roll over the unit top, can lift and slide over the top or lift and slide under the top. Some have pneumatic lifts for ease of operation. Surface materials vary; fabric surfaces tend to soil.

Desk-Based Corner Table

Corner units to make an L transition in desk-based system units can be curved or square. Cable troughs and raceways continue around the corner and power can be supplied from the pedestal.

Peninsular Work Surface

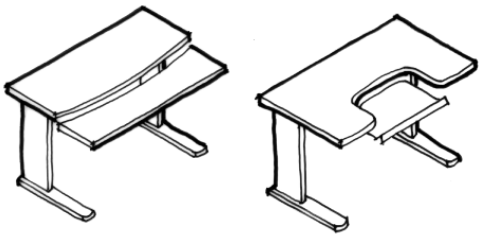
A peninsular work surface extending beyond the end of adjoining work stations makes a good place for informal meetings. Mounting these on casters makes them usable as free-standing conference tables.



Universal Design Work Surfaces

Some manufacturers produce work surfaces to be either left or right handed, but universal design is also available. Universal design eliminates the number of parts to count when ordering and helps eliminate ordering errors. Reconfiguring universal parts is more readily accomplished since all ends are finished and will work either as left or right handed. There are conditions when a handed work surface provides a better solution. It should be evaluated case by case.

Split Level Table Work Station



Available from several manufacturers, split level work surfaces allow each surface to be adjusted independently, even to stand-up height. Manual adjustment takes little effort and power adjustment is also available. Adjustment device should be integrated and not a separate part which can be misplaced.

Vertical Storage Unit with Power

Vertical storage units can accommodate power and data distribution through the base or through the top.

Portable Work Surface Companion

These portable units provide storage and can also accommodate a working surface for laptop computing and a place to secure the laptop while plugged in and charging.

Power Base

Panel bases provide the most common raceway for power distribution. Knock-out ports provide locations for outlets. A manufacturer-supplied power feed connects the raceway to building power.

Belt Power Strip

More and more systems are providing a power raceway above work surface height, for the convenience of users and installers alike.

Vertical Power

Power can be extended vertically through stackable panels and in some traditional panels as well. Or, vertical power raceways can be incorporated, extending to the ceiling if this is the power source.

Vertical Power Panel

In some traditional panel systems, power is brought from the powered base to the beltline with a vertical power panel. One of these is required at each point where power above the work surface is required.

Desk Top Power

Power at the work surface can be provided at small pedestals mounted to the surface from the vertical stanchions of desk-based components, from vertical power panels or from a continuous horizontal raceway.

Desk-Based Data Raceway

Data raceways can be added to desk-based systems, often concealed behind modesty panels.

Cable Trough

Cable troughs to contain the tangle of chords and cables are typically provided beneath work surfaces in all systems. These must usually be specified as an accessory.

Panel Top Ambient Light

Ambient up-lights provide diffuse reflected light in the work station, where it is needed. Most ceiling fixtures could be eliminated using this type fixture over large areas.

Under Storage Task Light	Every manufacturer has a task light which is mounted to the underside of overhead storage units. They provide general illumination but not necessarily the right light for specific tasks.
Bracket-Mounted Task Light	Bracket-mounted task lights fit into the panel or stanchion slots which also secure storage units and work surfaces. With the best of these you can get the light where it's needed.
Desk-Based Screen	Screens to increase visual privacy can be bracket mounted to desk-based work surfaces.
Desk-Based Modesty Panel	Modesty panels are typically provided at exposed fronts of desk-based system units. These are also used to conceal data raceways as well.
Deep-Drawer at Knee Space	Dual-depth drawers which slide under the work surface provide storage with no loss of knee space. The front is shallow for pencils (or for placement of the keyboard) while the back is deep enough for filing or personal storage.
Accessory Rail, Tool Bar or Accessory Tiles on Panel	All panels have provision for an accessory rail or rails. Many rails are generic, i.e. they work on panels supplied by a number of manufacturers.
Accessory Rail on Desk-Based Unit	Accessory rails can also be mounted to desk-based systems, either mounted to vertical stanchions or cantilevered off the work surface. These are also typically generic.
Accessories	Every manufacturer offers a number of different accessories including paper management accessories (file holders, letter trays), telephone stands, small white boards, pencil cups and computer support accessories.
Central Processing Unit Drawer	Slide-out drawers for CPUs get them off the floor, provide ventilation and good accessibility for service.
Slip-on 45 Degree Corner Adapter	A channel-shaped section slips over the edge of the work surfaces in an L configuration to provide a 45 degree position for computer use.
Ergonomic Accessories (refer to Air Force Ergonomic & Environmental Standards for further information)	Every manufacturer also offers a number of different accessories with ergonomic benefits including lumbar support pads, wrist pads, foot rests, and adjustable keyboard trays.
Monitor Support	Adjustable monitor supports allow users of all sizes to get the right elevation and tilt of the monitor screen. Monitors may also be mounted under the work surfaces. This is beneficial for certain conditions. (Examples: when user's workspace is limited and/or user's computer time is not extensive or when confidentiality is important).
Separately Adjustable Mouse Pad	Adjustable mouse pads, mounted to the keyboard tray, provide a variety of positions for right or left-handed mouse users. Mouse pad should be at the same height as keyboard to avoid wrist problems.

Adjustable Integral Wrist Rest

Adjustable wrist rests attached to the keyboard tray can be adjusted for the comfort of the user.

Tools

Tools – the fewer required the simpler it is to make the changes which make furniture systems really work for you. At least one manufacturer says that only one tool is required for one of its lines.

POWER & DATA PROVISIONS

Coordination

A frequent problem is the lack of coordination between the civil engineers and the communication squadron regarding furniture systems power and data provisions. Provisions for furniture systems electrical requirements must be made as a part of the construction documents. A timeline is also necessary to allow for electrical and communications hookup after the furniture installation.

Power

Power in furniture systems is distributed in enclosed raceways. In panels, these are almost always at the base and the metal housing forms the panel base. Secondary raceways at work surface height (beltline) can be installed in most stackable panel systems; power at the work surface in traditional panel systems is supplied by vertical raceway extensions or vertical power panels installed where power is required. In desk-based systems the raceway is usually mounted under the work surfaces with vertical extensions in the stanchions.

Each panel is either powered or unpowered; unpowered panels are more economical. Jumpers, typically sections of flexible conduit, are used to extend power through unpowered panels to the next powered panel. Outlets occur only in powered panels. Raceways typically are 8-wire (3-4 circuits) and the power wires can be configured in several ways. Load requirements determine the length of run of powered/unpowered panels between connections to the building power source.

Power/Communication/Data Separation

It was originally believed that power and communication/data wiring should be separated by one meter to eliminate electromagnetic interference (EMI). Most data cable is now Category 5. Some engineers maintain that no separation is required between this category cable and power wiring while others believe that they should be separated.

Communication/Data

The raceways in most furniture systems will accommodate communication and data wiring, separated from the power wiring by some form of barrier. In panels this means that the comm/data wiring would be at the base. In desk-based systems this cable would be in the raceway just under the work surface; separate data raceways are also used, paralleling the power raceway.

Also used for panel installations are raceways for communication and data mounted at the tops of the panels. To access these, the top cap is removed and the cables laid into the raceway, with drops through panels (where possible) or through panel connector assemblies. This location provides separation, but also easy installation inasmuch as the installer does not have to enter work stations

to access a base raceway. These raceways cannot be used when panels are of varying heights.

Integrated Wiring

Certain manufacturers allow power/communication/data wiring to be specified as integral parts of the panel. It is possible to divide the work stations into zones. Multi-service feeder cables can be installed from the wiring closet to points within each zone which in turn feeds the receptacles within each work station. This eliminates the need to reroute, remove, or recable each panel each time a work station is reconfigured.

Fiber Optic Cable

Where fiber is proposed for use inside a building, care should be used in selecting furniture systems which can accommodate it. Typically, minimum bends are 4 inch radius. Most, but not all, system corner assemblies and raceways can accommodate this.

Connection to Building Power

All power from furniture system components must be connected to the building power supply by a licensed electrician using a power feed. The power feed, usually like a section of flexible conduit, is supplied by the panel manufacturer and has a device to connect to the raceway. It is connected to the building power by splicing wires. The following are some of the termination devices for building power which you may encounter.

Wall Supply

Simple and inexpensive, a wall box (junction box or J-box) is the obvious choice where a panel or desk-based piece is near a partition or a column which can be furred out.

Ceiling Supply

If no walls or columns are available, ceiling supply is the most economical. Power poles can be used, though they are almost universally disliked because they break up established unity. Their use should be kept to a minimum in order to prevent the creation of an unsightly forest of power poles. Some panel manufacturers offer extensions of vertical raceways which blend with the panels better than power poles.

Architectural devices can be incorporated to provide ceiling supply. Sometimes called portals, these are usually fake columns, though they can be treated in a manner which reinforces the overall design.

Flat Wire

If no floor or wall box is available where needed, flat wire can bridge the gap between building power outlet and systems installation. Use only under carpet tile. Wheeled cart traffic can disrupt some data transmissions.

Tombstones

These raised metal monuments can be added by coring the floor slab but may not occur precisely where you want them because they must miss structural obstructions below the floor. They cannot be used where there is no access from below (including slabs on grade) unless the electrical rough-in is already in place. Tombstones must miss storage/filing pedestals under work surfaces and tend to be awkward when they occur in knee spaces below work surfaces.

Floor Boxes

These come in a variety of configurations but have surfaces flush with the floor, eliminating obstructions within work stations except for the conduit necessary between the box and the base raceway. Adding a floor box is very expensive; they should be designed into the building. As with tombstones, precise location is usually not possible because they must avoid structural obstructions below the slab.

Access Floor

The most flexible, but justifiable only in areas with very intensive communication and data requirements. Conduit can drop through floor at any point.

BUDGETING FOR FURNITURE SYSTEMS

Furniture systems represent a significant portion of the cost of a project housing office functions. It is essential that their cost be budgeted into the project from its inception. The time involved in furniture systems acquisition must also be budgeted into the project from the beginning. Be sure, in large projects, to build adequate time into the schedule for programming. Be aware that the lead-time for the furniture system acquisition can take several months. Specific details on budget and procurement are contained in the acquisitions chapter.

Furniture systems can be part of a SID project if they are specifically identified on the DD Form 1391. They are O&M funded and can be included in the general construction contract along with such items as built-in casework. Furniture systems are listed on the DD Form 1391 as a non-add entry in Block 9 for "Equipment Provided from Other Appropriations". In Block 12b, the furniture systems should be as an O&M funded item, the fiscal year the funds are requested and the line item cost. Accessories can account for a significant portion of the furniture systems package and should be budgeted with the basic system components.

PROGRAMMING FURNITURE SYSTEMS

The programmer will find input from three levels to be of value in making determinations regarding what to plan and design: from the user; from the department head; and from a senior manager. The design cannot respond to every need, but a thorough programming effort will identify a range of work station types which satisfy most needs and which can be provided with additional or special components to address specific user needs.

The following are items which could be included on programming questionnaires circulated to the three groups. No form replaces a personal programming conference and this should be done wherever possible.

Future work station users supply the following information

- Time of day when most difficult tasks are faced
- Number of hours per week spent reading
- Type of reading, e.g. memos, orders, computer reports, creative materials, sorting/collection

- Number of hours per week spent at VDT screen
- Number of hours per week spent writing
- Proportion of writing time spent sitting vs. standing
- Number of hours per week spent in computer input, phone calls received and placed, and intercom
- Number of hours per week that you are away from your work station
- Who visits you in your work space, how often, for what purpose and for how long
- Whose work spaces do you visit, how often, for what purpose and for how long
- Average number of times per day that you enter and leave your work space
- Percentages of your work which is confidential, including paperwork, conferences and telephone conversations
- Percentage of time that your tasks require isolation for concentration and listing of these tasks
- Frequency with which you need access to files aside from what is close at hand, including: access when on telephone; access once or twice daily; frequent access within 15-30 minutes; occasionally; never
- Composition of files in your work area, including: contracts; reports; correspondence; data tapes; diskettes; financial information; employee records; other.
- Type of filing systems used, including: vertical; lateral; portable
- Number of separate projects worked on in the average day, including the following task types: keyboard; writing; other.
- Number of active projects going on at the same time
- Duration of paper tasks: one hour; four hours; one day; one week; longer
- List of items normally on work surface: CPU; VDT; keyboard; mouse; printer; telephone; in/out trays; folders; computer printouts; writing pads; paper piles.
- Are you right or left handed
- List of items needed in your work space: computer; printer; telephone; typewriter; calculator; dictation equipment
- Supplies needed in your work space: letterhead; notebooks; forms; other
- Items for which you need lockable storage: files; supplies; currency; reference materials; personal items
- Statement of aspects of the work environment that you like or consider helpful in your work

Department heads take a broader view of the organization and can provide the following more general information.

- Diagram of organizational structure
- Description of services provided by your unit, focusing on a typical workday and the type of interaction or activity in which you and members of your unit engage
- Listing of employees in your unit indicating usable square footage appropriate for each and the type of work area needed, e.g. private work station, shared private work station, open work station
- Diagram indicating adjacency requirements among the various staff components of your unit

- Indication of contact between personnel of your unit and: personnel of other on-base units; vendors; contractors; general public; other
- Define computer screen orientation in terms of security concerns when users are away from their desks
- Identify requirements for safes and security restrictions
- Existing or proposed power provisions and the availability of clean power
- Identification of conference facilities required by your unit: formal and private; semi-private; informal. Also, a listing of equipment required for each space
- Number of file drawers (vertical, lateral or other) which your unit presently has, together with a projection of need over the next five years. Also, indicate whether or not the files are active and are secured
- Number of linear feet of shelving which your unit presently has together with a projection of need over the next five years
- Listing of equipment required by your unit: computer stations; drafting stations; fax; printer; plotter; copier. Also, the power requirements and what pieces require dedicated circuits. Indicate future equipment needs which are known

Senior management possesses information which will chart future directions which is very important to designers.

- Identification of future equipment considered for the unit in the new layout of which middle management may not be aware
- Substantial changes contemplated for the unit structure which could impact the new layout
- Description of shortcomings of existing unit layout
- Description of image which the new office layout should communicate
- Three to five adjectives that would best describe the atmosphere of the new office layout to unit personnel and visitors

DESIGN ISSUES

- Layout
- Evaluation of the programmatic material will yield patterns which will begin to suggest the basic design of a range of work stations. These include:
  - Commonality in terms of basic tasks
  - Storage needs
  - Equipment needs
  - Shared equipment needs
  - Requirements for confidentiality
  - Need for privacy
  - Patterns of collaborative work
  - Formal and informal conference spaces
  - Need for conferencing space within work stations
  - Adjacency requirements based on work process
  - Telephone/networking requirements

More specific guidance on the interior design or space planning services will be included in the acquisitions chapter.

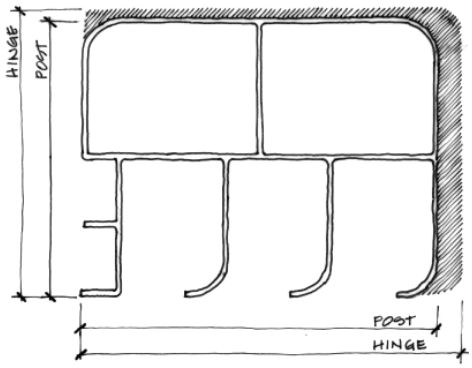
People aren't made with cookie cutters and work stations shouldn't be either. Develop a series of basic work station designs, then customize individual stations with storage and filing components and accessories to meet the specific requirements of the user. Recognize and express in the design, the differences in the jobs of the various users.

Status should be related to the task performed and recognized with upgraded materials and better accessory packages, not by increasing the square footage beyond that which the task justifies.

Building code regulations for corridor widths and dead end corridors typically apply to systems furniture layouts. Consult your code. Life safety issues must also be considered and codes consulted for specific issues such as egress, panel heights, and buildings with or without a sprinkler systems.

Field measurements are essential to verify actual clear dimensions available. Modifying components to fit existing conditions is costly and can void the warranty.

Require vendors to provide record drawings, both in hard copy form and electronic medium form, along with a products parts list (including product numbers).



Panel creep involves the addition of inches along a run of panels due to connections from panel-to-panel. These inches can add up to a significant dimension per the number of panel connections. Panel-to-post connection requires measurement from post centerline to centerline resulting in accurate dimensioning and no creep.

Do not rely on the construction documents floor plans. Check the lighting, power, communication and fire alarm plans. Identify all elements and devices which could be in conflict with your installation and then verify the actual placement of these devices. Particularly troublesome devices are thermostats, fire alarm components, air handlers, control panels and sprinkler heads. Consult your code. Have final layouts reviewed and approved by CE/MAJCOM design staff, Fire Marshall, and Safety prior to ordering.

If traditional panels are used, the height should be held to the minimum commensurate with privacy requirements and the need for overhead storage. Varying the panel heights adds interest, but could limit flexibility in rearrangement.

If stackable panels are used, consideration should be given to a base panel height just above the work surface, with additional units stacked on where

required for privacy or overhead storage. This gives maximum flexibility for future rearrangement.

If overhead storage units are stacked, manufacturers often require equal distribution on either side of the panel. Consideration should be given to the strength of the connector that attaches the panel to the next panel. Panels are only as strong as their connectors. It is generally less expensive if freestanding files or bookshelves are used rather than stacking overhead storage units.

Carpet tile is preferable for use in areas where furniture systems are to be installed. Replacing carpet tile under panels and desk-supported elements is laborious, but easy compared to replacing roll goods.

Responsibilities

The vendor is responsible for checking the field measurements and for all code and ADA compliance. The government's representative, such as the AE or an in-house knowledgeable party, is responsible for checking the construction documents. A vendor should never break a life safety code to please a customer.

Accommodation for the Disabled

Furniture systems accommodate well. The ability to reconfigure them to provide more maneuvering room and to adjust the heights of work surfaces and storage components make accommodation for the mobility impaired relatively easy. Pedestal units suspended from the work surface allow clear toe space for maneuvering. Pedestal-base tables are more wheelchair friendly, but leg-supported tables are preferable when someone uses the table edge for support. Power and data outlets above the work surface are easier to reach. Some drawer/door pulls are easier to grasp than others.

For those with visual impairments, work surfaces which are medium to light in tone should be used in lieu of dark tones or white. Contrasting-color edge banding make edges more visible. Rounded corners and edge banding are preferable to sharp corners. More and more designs are cognizant of universal design.

Upgrading Programs

Leading manufacturers have programs for upgrading existing products. Surfaces can be recovered and there are retrofit products for components in excess of 20 years old. These include provisions for power distribution, data cabling, wire management, storage and filing components and accessories. This long-term commitment to product improvement reduces life-cycle costs while ensuring that installations can be kept up to date visually as well as technologically.

Acoustics

Typewriters and dot printers are noisemakers of the past. The use of acoustical ceilings and carpet is virtually universal. The acoustically absorptive quality of panel products is not as important as it once was. Acceptable office environments can be achieved using all, or mostly all, hard surfaces. Where confidentiality of speech is a consideration, consider special acoustical cores for the panels. The cost of acoustical panels can be up to 10% more expensive than non-acoustical panels. Once components, such as tackboards and overhead cabinets are added, this extra cost is wasted. Acoustical panels should

only be installed in areas where their benefits are actually used. In certain situations providing suitable background noise or white sound can blend speech into the background to prevent conversation from being overheard.

Integration of Lighting

All systems offer standard task lights, usually either fluorescent strips mounted to the underside of overhead storage units or bracket-mounted to a vertical support or anchorage element. Many are interchangeable among manufacturers. Most provide diffused general light on the work surface but do not necessarily provide appropriate background light for computer users or adequate lighting for document holders.

Some manufacturers offer ambient up-lighting fixtures which can be mounted to the tops of panels or stanchion-mounted to desk-supported units. In large installations these can almost totally replace ceiling fixtures, providing diffuse reflected light at the work stations, where it is needed.

Materials

Combinations of basic and upgrade materials for panels, work surfaces, pedestals and overhead filing/storage units can be used to enhance status or create a hierarchy of work station design.

If dark panel colors are used in large areas they tend to drink light and can make the installation appear somber or gloomy, except in areas with abundant natural light. They can also create undesirable visual contrasts for writing and as backgrounds for work at VDTs. Material selection must be considered in concert with the lighting conditions. For example, an application where dark colors may be beneficial is one where a low level of general lighting and minimal glare is necessary for intense computer applications. A panel fabric with a medium color value and a subtle pattern is a good soil hiding device.

LESSONS LEARNED

Electrical/Communication Coordination

Proper coordination between all parties involved in providing power and data is necessary to the installation of a furniture system. Refer to Coordination (page 11 of this chapter).

Creep

Creep can cause the addition of unplanned inches to a row of panels. If not planned for, the problem may only be discovered during installation. Refer to creep paragraph of Design Issues (page 16 of this chapter).

Ergonomics

The mouse pad and keyboard should be a contiguous/integrated unit. It should not be necessary to reach for them from awkward positions. Monitors should be positioned where the user should not have to look up to the screen.

Loading Factors

Panel runs require counter supports and perpendicular support at intervals to avoid tipping over.

Verification of existing conditions with construction drawings is necessary to avoid finding an unforeseen column or chase or any conflicting dimension during installation.

Additional Items

Sprinkler heads need a minimum of 12" of space to pop-down and water distribution cannot be blocked. Exit signs must be visible from all points within an area when standing. Maintain minimum corridor space. Avoid winding, dead-end walkways. Ensure compliance with ADA

CONSTRUCTION DOCUMENTS

Construction Drawings

The requirements for construction drawings for furniture systems for Air Force projects are set forth in the Air Force Interior Design Presentation Format.

Specifications

Two sample specifications, one for desk based and one for stackable, based on U.S. Army Corps of Engineers Guide Specification Section 12705 are included at the end of this chapter. The following are general specification requirements which should be considered for any installation.

Component Inventory

A computerized inventory of each part and piece comprising the installation should be required of the vendor. The identity of the component is required not just the product number. When the installation is reconfigured, knowing sizes and quantities of various components simplifies the revised layout.

As-Built CAD Files

CAD files of the completed installation, in a format usable by the base civil engineering staff and reflecting modifications made during installation, should be required of the vendor.

Installation Provisions

Installers must be licensed or certified by the manufacturer of the system which is provided. This should be both specified and verified prior to award of contract.

Some installations will require the presence of security personnel during working hours. Identify the party responsible for paying for security costs which may be incurred.

Specify the make-up of the installation crews. A good composition is one supervisor, two or three trained mechanics and three or four movers.

Don't specify the unreasonable. Find out from the manufacturer's representative how many man-hours will be required to assemble one of your typical work stations, from start of unloading to completion of clean-up. State your timetable for installation in the specifications. Let the bidders know if night work is possible. Consider limiting the hours worked per shift; the quality of work will drop off with excessively long shifts.

A licensed electrician is required to make hard-wired connections to the building power source. Identify the party responsible for retaining the electrician – supplier, installer or the base.

Warranty

Warranties are available from one year to lifetime (with some exclusions). You will pay for what you specify, so specify only what you need. In most cases it's very difficult to anticipate the use of a system or product more than ten years out.

BID/PROPOSAL EVALUATION

In evaluating bids all parties should be aware that more than just the bottom line needs to be considered. For example, if the specifications call for tackboards and the bidder comes in with tackable panels instead, in order to lower the bottom line, take into consideration that some tackable panels are not really tackable.

Require each vendor to provide a mock-up workstation of their exact product as bid, so the buyer can examine what they will be getting first hand before awarding furniture contract.

OPERATIONS & MAINTENANCE

Determine who will be responsible for retaining the list of components which comprise any installation. The list should be updated as new components are acquired, existing components refurbished or damaged components eliminated. Make sure the list of components state the identity and not just the product number.

If the installation is reconfigured, update the CAD files to reflect this and reference the components list so that there is a record of what is used where. Reconfiguring a furniture systems installation without the presence of a licensed installer can void the warranty.

ENVIRONMENTAL ISSUES

The furniture industry in general is making a genuine effort toward sustainable design, though some manufacturers are much further along than others. The Air Force should encourage these efforts by considering sustainability issues in the products selected for its projects.

Green Manufacturing

Initiatives in this field, which are documented in product literature, include reduction of VOCs by the use of powder coatings, use of low solvent coating processes and solvent-free or low-solvent solutions for adhesives, foams and wood finishing products. Wood is obtained from domestic sources or from tropical forests only where documentation is available of management according to sustained yield principles, e.g. excess materials are eliminated from products and aggressive programs reduce manufacturing waste and recycle its byproducts.

Recycled Products

Several furniture system manufacturers have initiated programs for the purchase of their early products for remanufacture and resale at prices substantially less than for new elements. GSA Schedule pricing for new products is so advantageous that it unfortunately makes these remanufactured products generally uncompetitive for AF projects.

Packaging

Furniture system components can be shipped either in cardboard cartons or blanket-wrapped. Carton packing generates an enormous amount of waste. Blanket-wrapping should be required for all large AF projects; however, it is generally not available for orders smaller than one truckload.

POST-OCCUPANCY EVALUATION

Soliciting feedback from those occupying work stations in the installations we have designed is the only positive way to ensure that the design has responded to their needs and that mistakes are identified so that they are not repeated. The adaptable nature of furniture systems makes it relatively easy to correct mistakes or miscalculations by reconfiguration and retrofit.

A POE should ask the following.

- Do the work surfaces accommodate the tasks which you perform and the equipment you use to accomplish them?
- Is adequate storage available to house the materials you use on a regular basis?
- Are power and data outlets available where needed and can they be relocated if the need arises?
- Is ambient and task lighting available and adequate?
- Does the office layout encourage interaction among personnel?
- Does your work space provide an environment conducive to concentration? How might this be improved?
- Is your work space a pleasant place to be? How might this be improved?

CHANGING WORK STYLES AND SYSTEMS FURNITURE

The offices we work in today are very different from those of 15 years ago and those of 15 years from now will be far more different still. The pace of change in the Air Force will not be that of the private sector, but the basic forces which drive change are the same. Downsizing is a reality everywhere and the Air Force will see a flattening in the organization of many units. The imperatives of the do more with less business climate are already prodding the Air Force to adopt new technologies. With these basic changes a certainty, how does office planning and design respond?

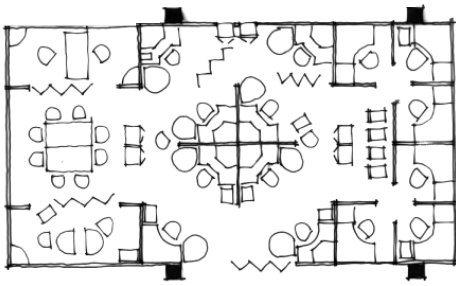
A few things are clear. Space will be more universally used as a tool for productivity, not a measure of status. The ability to adapt to changing project and work process needs quickly, with minimum disruption and at minimal cost, will be essential. Flexibility will be even more important and the role of furniture systems will be even greater than in the past. But the systems will also change.

There will still be panels, but far fewer of them than in the past, and layouts will be less rectilinear. Mobility – the ability to change work station configurations quickly – will be one of the key elements in system selection. It's already here in some systems where components including work surfaces, carts, lockers, tables, pedestals and communications tools such as easels and

display items are on wheels. Work stations will consist of combinations of relatively fixed and completely mobile elements. All of this will enable office organizations and individual users to take control of their surroundings, independent of an installer's schedule.

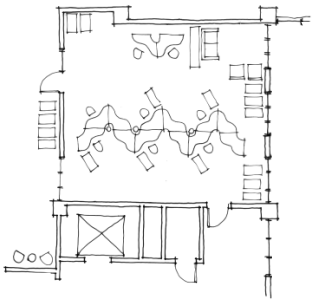
The following are descriptions and illustrations of some of the alternative concepts which reflect these changing work styles. None will be ideal for any installation, but elements of one or more may have application when used in combination with more traditional layouts. A rigorous programming effort will indicate the right mix.

Teaming



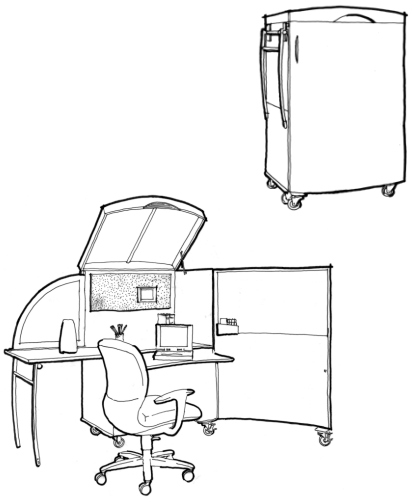
The term is over-used but the concept is a reality. Organizations are forming self-managed work units as never before. The goal is to make employees accessible to one another, enhancing collaboration, improving communications and increasing productivity – all while helping organizations run lean. Teaming layouts have fewer barriers and more common space that promotes mentoring and collaborative work. It does not save space overall, but redistributes it; the physical limits of work stations are not precisely defined and the distinction between an individual's space and common space is blurred.

Hoteling

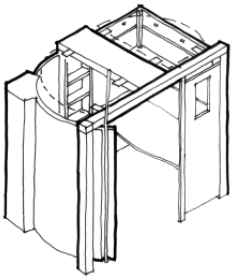


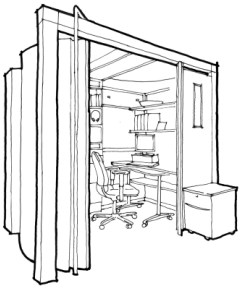
More people are in their offices less and less of the time, accomplishing their work on the road or at a remote assignment. Hoteling is a space-effective way to provide a home base for some of these workers in some situations. Unassigned work stations providing work surfaces, panels if appropriate, telephones, power and data ports, etc. are either reserved ahead or assigned on a daily basis by a facility manager. Workers are provided with a dedicated locker and, usually, a mobile pedestal which contains filing material and lockable storage.

Office in a Box



There are only a few of these on the market and manufacturers are still experimenting as to what and how much to incorporate into them. Some users see the concept as ideal for temporary offices to staff up for a project, as an element to complement teaming arrangement by providing a space for private work or as the work station in a hoteling concept. It could also be shipped to a remote location to serve as a site office. One unit on the market is somewhat permanent and can be closed off with a sliding door. Another is on casters and can be completely folded up to resemble a piece of furniture.





TELECOMMUTING

Not new, telecommuting has been around for over 20 years. It works for people who do most of their work away from the office but must remain electronically connected. Telecommuting lends itself well to the hoteling concept. In another variation, employees work in a facility near their work location owned by the employer. GSA maintains such facilities in the Washington, DC area for its staffers. The drawback to telecommuting is that the telecommuter is having to maintain or coordinate the repair of complicated office equipment. Telecommuting works best as an adjunct to the office rather than a replacement.

MATRIX

For the user's convenience, we have categorized all the current Federal Government Furniture Systems Contractors into panel supported, stackable, cluster, floor-to-ceiling walls, desk-base, beam-supported, wall-based, cabinet-base, hybrid and work stations accessories.

PANEL SUPPORTED SYSTEMS

Contractor	Product Name	Contract #
Advance Office Concepts	Status Seeker II	GS-29F-0227G
Allsteel, Inc.	8000 Series	GS-29F-0120G
Allsteel, Inc.	Aurora	GS-29F-0120G
The Alma Group		GS-29F-0182G
American Seating	Framework Office	GS-29F-0124G
American Seating	Invitation Wood	GS-29F-0124G
Artopex Plus, Inc		GS-29F-0200G
ASC Office Environments	Diversified's Delta	GS-29F-0162G
Cano Corp.		GS-29F-0218G
Capitol Furniture Dist. Co.	La-Z-Boy's RJ Plus II	GS-29F-0135G
CenterCore Group	Spacemaker 2000	GS-29F-0145G
Domore	Series System 7	GS-29F-0182G

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PANEL SUPPORTED SYSTEMS (CONT.)

Contractor	Product Name	Contract #
Executive Office Concepts	Options	GS-29F-0214G
Flex-Y-Plan Industries	Workplace System	GS-29F-0201G
GF Office Furniture	OPS/Connections	GS-29F-0139G
Glen O'Brien Partition	Opus One	GS-29F-0215G
Hamilton Sorter		GS-29F-0194G
Haworth, Inc	Places	GS-29F-0137G
Haworth, Inc	Unigroup	GS-29F-0137G
Herman Miller	Action Office Series 1	GS-29F-0150G
Herman Miller	Action Office Series 2	GS-29F-0150G
Herman Miller	Action Office Series 3	GS-29F-0150G
The Hon Co.	Concensys	GS-29F-0163G
The Hon Co.	Simplicity II	GS-29F-0163G
Interior Systems		GS-29F-0208G
Invincible Office Furniture	Systems Furniture	GS-29F-0203G
Kimball International	Cetra	GS-29F-0177G
Knoll, Inc.	Equity	GS-29F-0140G
Knoll, Inc.	Morrison Network	GS-29F-0140G
Marvel Group	Unison	GS-29F-0168G
Packard Industries	Officenter 2000	GS-29F-0176G
Panel Concepts	Top Line	GS-29F-0172G
Panel Concepts	Bottom Line	GS-29F-0172G
Pleion Corp		GS-29F-0180G
Rosemount Office Systems	Basic Solutions	GS-29F-0152G
Rosemount Office Systems	Private Spaces	GS-29F-0152G
Southern Metal Industries	Synerflex	GS-29F-0213G
Steelcase, Inc.	Series 9000	GS-29F-0141G
TAB Products	Panels & Posts	GS-29F-0116G
Tibbet, Inc.		GS-29F-0183G
Transwall Corp	Soundivider	
Trendway Corp	Choices	GS-29F-0165G
UNICOR	Systems XXI	Mandatory

STACKABLE PANEL SYSTEMS

Contractor	Product Name	Contract #
ASC Office Environments	Diversified's Delta	GS-29F-0162G
Haworth	Premise	GS-29F-0137G
Herman Miller	Ethospace	GS-29F-0150G
Kimball International	Cetra	GS-29F-0177G
Knoll	Reff	GS-29F-0140G
Transwall	Reasons	GS-29F-0114G

CLUSTER WORKSTATION SYSTEMS

Contractor	Product Name	Contract #
ASC Office Environment	Diversified's Delta	GS-29F-0162G
CenterCore	Spacemaker 2000	GS-29F-0145G
Datum Filing Systems	Apollo	GS-29F-0185G

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CLUSTER WORKSTATION SYSTEMS (CONT.)

Contractor	Product Name	Contract #
Datum Filing Systems	Eclipse	GS-29F-0185G
Domore	Series System 7	GS-29F-0182G
Executive Office Concepts	Options	GS-29F-0214G
Hamilton Sorter		GS-29F-0194G
Knoll	Equity	GS-29F-0140G
Packard Industries	Axis	GS-29F-0176G
Southern Metal Industries	Synerflex	GS-29F-0213G
TAB Products	Cluster Workstation	GS-29F-0116G
Transwall Corp	Soundivider	GS-29F-0114G
Trendway Corp	Choices	GS-29F-0165G

FLOOR TO CEILING WALLS

Contractor	Product Name	Contract #
Artopex Plus, Inc.		GS-29F-0200G
ASC Office Environments	Diversified Delta	GS-29F-0162G
Herman Miller	V-Wall	GS-29F-0150G
Interior Systems, Inc.		GS-29F-0208G
Knoll	Reff	GS-29F-0140G
Transwall Corp	Corporate	GS-29F-0114G
Transwall Corp	Twinline	GS-29F-0114G
Trendway Corp	TrendWall	GS-29F-0165G

DESK-BASED SYSTEMS

Contractor	Product Name	Contract #
ASC Office Environments	Diversified's Series 4300	GS-29F-0161G
Capitol Furniture Dist. Co.	La-Z-Boy's RJ Plus II	GS-29F-0135G
Executive Office Concepts	Options	GS-29F-0214G
Executive Office Concepts	WCF System	GS-29F-0214G
Flex-Y-Plan	Factors Modular	GS-29F-0201G
GF Office Furniture	OPS Desk Collection	GS-29F-0139G
GF Office Furniture	Stratum Desk	GS-29F-0139G
GF Office Furniture	Connections Desk	GS-29F-0139G
Haworth	Crossings	GS-29F-0228D
Haworth	Premise	GS-29F-0137G
Haworth	Tango	GS-29F-0137G
Herman Miller	Arrio	GS-29F-0150G
Herman Miller	Newhouse Group	GS-29F-0150G
Herman Miller	Relay	GS-29F-0150G
Jax International	Synergy	GS-29F-0117G
Jax International	Master Series	GS-29F-0117G
Kimball International	Cetra	GS-29F-0177G
Kimball International	Footprint	GS-29F-0177G
Knoll, Inc.	Morrison Network	GS-29F-0140G
Marvel	Desk Systems	GS -29F-0199G
Marvel Group	Ensemble	GS-29F-0168G
Omni International	Omni Space/Station	GS-29F-0113G

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DESK-BASED SYSTEMS (CONT.)

Contractor	Product Name	Contract #
Southern Metal Industries	Interface	GS-29F-0213G
Steelcase	Context	GS-29F-0141G
Steelcase	Ellipse	GS-29F-0153G
Watson Furniture Systems	Basik 1	GS-29F-0109G

BEAM-SUPPORTED SYSTEMS

Contractor	Product Name	Contract #
Haworth	Race	GS-29F-0137G
Rosemount Office Systems	Velocity System	GS-29F-0152G

WALL-BASED SYSTEMS

Contractor	Product Name	Contract #
Kimball International	Footprint	GS-29F-0177G

CABINET-BASED SYSTEMS

Contractor	Product Name	Contract #
Herman Miller	Liaison	GS-29F-0150G

HYBRIDS

Contractor	Product Name	Contract #
Steelcase	Personal Harbors	GS-29F-0153G

WORKSTATION ACCESSORIES

Contractor	Product Name	Contract #
Knoll	Orchestra	GS-29F-0140G
Knoll	Knoll Extra	GS-29F-0140G
Steelcase	Details	GS-29F-0141G
Steelcase	Details	GS-29F-0153G

GUIDE SPECIFICATIONS

Refer to Stackable Panel Furniture Systems Guide Specifications.

Refer to Desk-Based Furniture Systems Guide Specifications.

Contributing manufacturers:

Centercore
Haworth
Herman Miller
Kimball
Knoll
Steelcase
Transwall